DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

MISCELLANEOUS FIELD STUDIES MAP
MF–1405–C
PAMPHLET ACCOMPANIES MAP

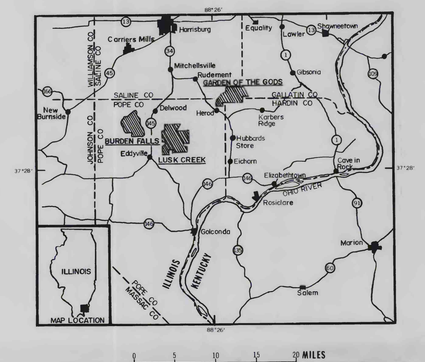


Figure 1.—Index map showing location of the Lusk Creek Roadless Area and other roadless areas in southeastern Illinois.

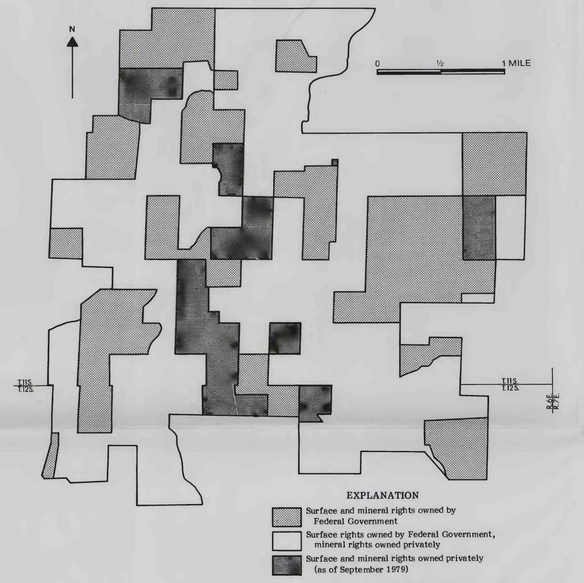


Figure 2.—Surface- and mineral-rights ownership of the Lusk Creek Roadless Area.

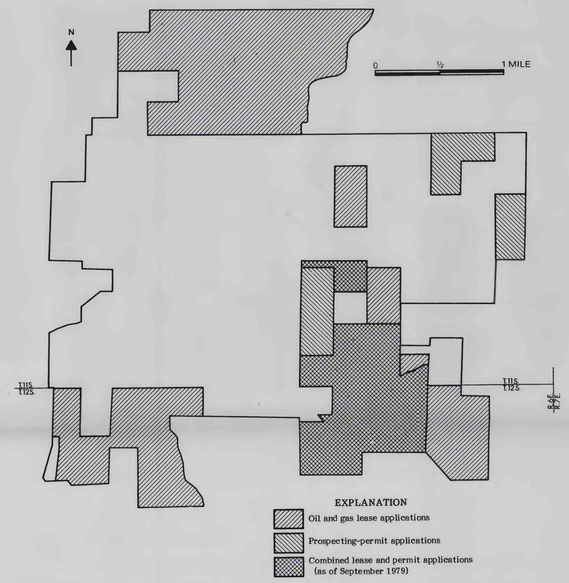


Figure 3.—Oil and gas lease applications and prospecting permit applications, Lusk Creek Roadless Area.

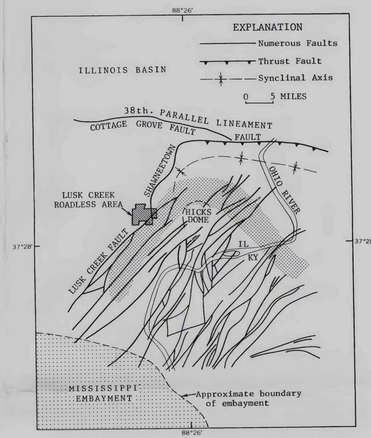
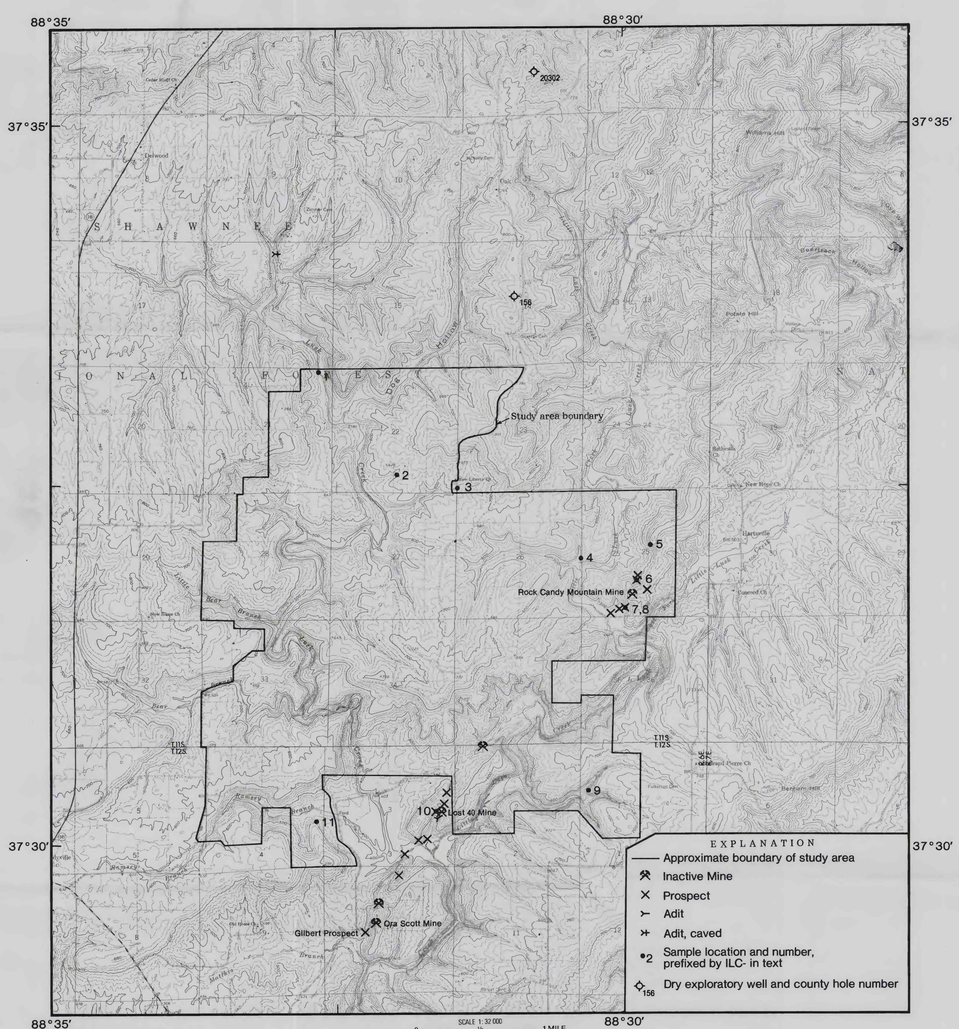
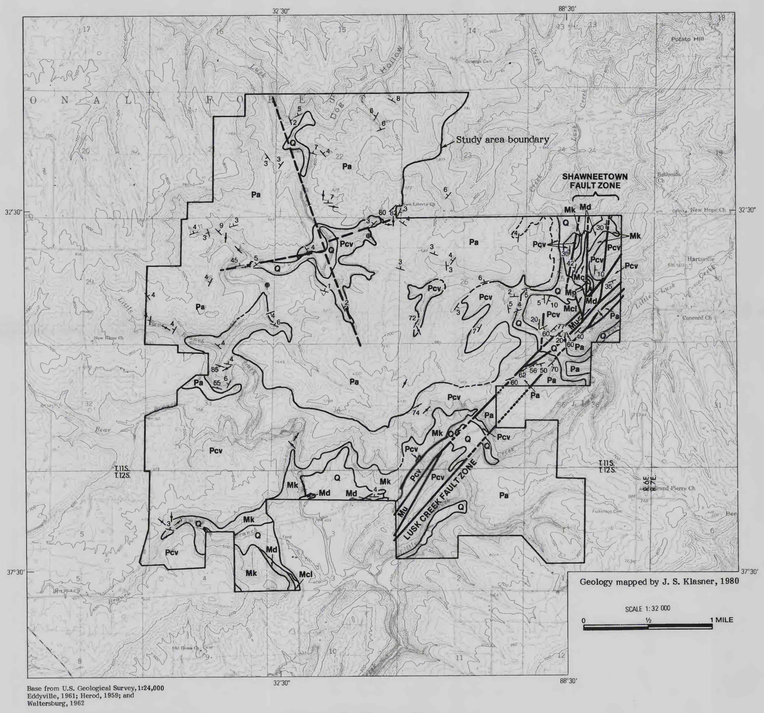


Figure 4.—Relationship of the Lusk Creek Roadless Area to the Mississippi Embayment fault zone, 38th Parallel Lineament, and the Illinois-Kentucky fluorspar district, after Brecke(1979) and Heyl and others(1965). The northeast and northwest boundaries of the fluorspar district are shown by the finer stippled pattern. Hicks dome (Baxter and Desborough, 1965) is a topographic high where stratified rocks dip outward from the dome center. Arcuate faults and a radial fracture pattern (too small to be shown here) surround the dome.



Base from U.S. Geological Survey, 1:24,000
Eddyville, 1961; Herod, 1959; and
Waltersburg, 1962

Figure 5.—Mine and prospect map of the Lusk Creek Roadless Area showing sample and well localities.



Base from U.S. Geological Survey, 1:24,000
Eddyville, 1961; Herod, 1959; and
Waltersburg, 1962

STRATIGRAPHIC COLUMN

- Q — QUATERNARY
- UNCONFORMITY
- Pa, Pcv — PENNSYLVANIAN
- DISCONFORMITY
- Mu, Mk, Md, Mcl, Mp — MISSISSIPPIAN

DESCRIPTION OF ROCK UNITS

- Q — ALLUVIUM (QUATERNARY)—Clay, silt, and gravel along streams
- Pa — ABBOTT FORMATION (PENNSYLVANIAN)—Thin-bedded to massive siltstone, sandstone, and minor conglomerate with intercalated shale beds. Some units crossbedded
- Pcv — CASEYVILLE FORMATION (PENNSYLVANIAN)—Generally thick-bedded sandstone and conglomerate; minor thinly bedded siltstone and shale
- Mu — UNDIFFERENTIATED UNIT (MISSISSIPPIAN)—Fine-grained quartz sandstone and sandstone breccia; occur along faults
- Mk — KINKAID LIMESTONE (MISSISSIPPIAN)—Argillaceous, bioclastic limestone and micritic limestone
- Md — DEGONIA SANDSTONE (MISSISSIPPIAN)—Thin-bedded gray siltstone
- Mcl — CLORE LIMESTONE (MISSISSIPPIAN)—Fine-grained red sandstone
- Mp — PALESTINE SANDSTONE (MISSISSIPPIAN)—Fine-grained buff sandstone

Contact, dashed where uncertain.

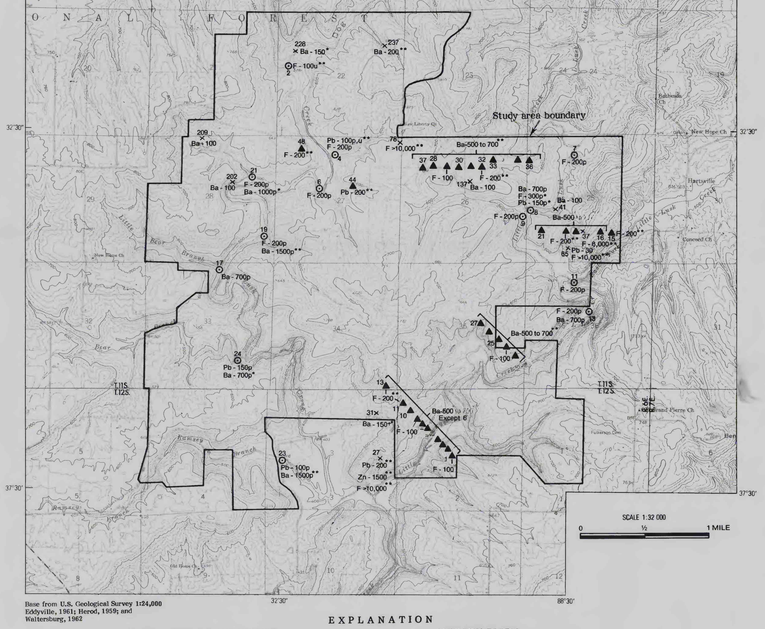
Fault, Dashed where uncertain.

Strike and dip of beds
- Inclined
- Vertical
- Horizontal

Strike and dip of shear foliation

Strike and dip of joint

Figure 6.—Geologic map of the Lusk Creek Roadless Area.



Base from U.S. Geological Survey 1:24,000
Eddyville, 1961; Herod, 1959; and
Waltersburg, 1962

EXPLANATION

SAMPLE LOCALITY AND NUMBER

- 217 × — Bedrock sample
- 29▲ — Soil sample
- Stream-sediment sample
  - 6 — panned (p)
  - 6 — unpanned (u)

AVERAGES IN PPM

	Ba	F	Pb	Zn
Bedrock sample	68	Most less than 300[a]	Generally not detected	Generally not detected
Soil sample	383	Most less than 100	22	Not detected
Stream-sediment sample				
panned (p)	600[b]	144	68	Not detected
unpanned (u)	148	Most less than 100	26	Not detected

[a]Some samples have exceedingly high concentrations (13,000 to 154,000 ppm) and are shown as F 10,000 ppm.

[b]Panned stream-sediment samples with barium concentrations of 500 ppm and above are shown; barium concentrations less than 500 ppm are not shown.

Figure 7.—Above average, high,* and anomalous** values (in ppm) of indicator elements for fluorspar deposits in selected samples, Lusk Creek Roadless Area. See text for discussion.

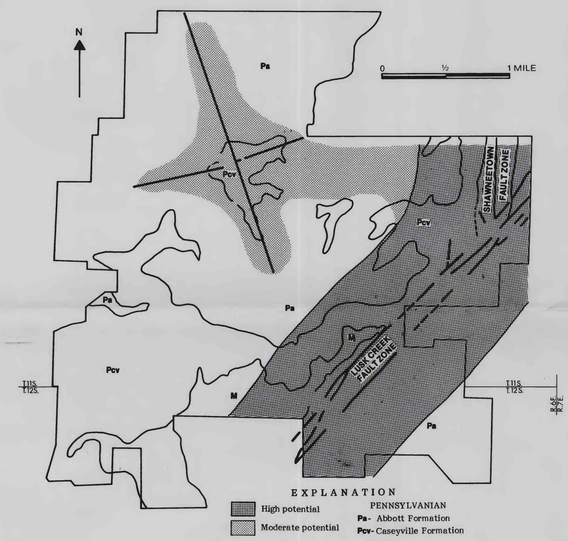


Figure 8.—Fluorspar potential of the Lusk Creek Roadless Area.

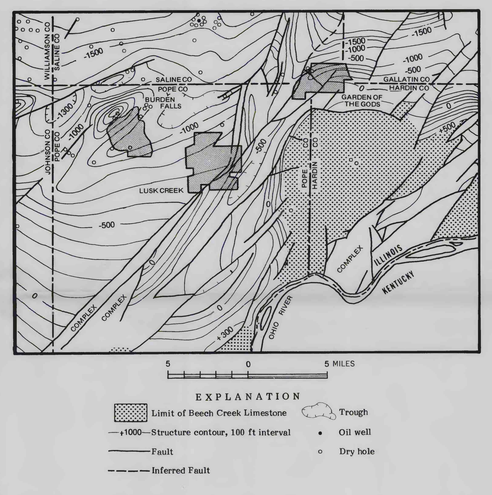


Figure 9.—Structure-contour map of the Beech Creek Limestone and location of oil and gas wells relative to the Lusk Creek Roadless Area. Structure from Bristol, 1967.

Studies Related To Wilderness

The Wilderness Act (Public Law 88-577, September 3, 1964) and related acts require the U.S. Geological Survey and the U.S. Bureau of Mines to survey certain areas on Federal lands to determine their mineral resource potential. Results must be made available to the public and be submitted to the President and the Congress. This report presents the results of a mineral resources potential survey of the Lusk Creek Roadless Area (09-106) in the Shawnee National Forest, Pope County, Ill. The area was classified as a further planning area during the Second Roadless Area Review and Evaluation (RARE II) by the U.S. Forest Service, January 1979.

SUMMARY

The 6,703-acre Lusk Creek Roadless Area lies in the Shawnee National Forest, Pope County, Ill., about 12 mi south of Harrisburg, Ill. and 2 mi northeast of Eddyville, Ill. Roughly 89 percent of the surface rights and 58 percent of the mineral rights are under Federal ownership. The eastern part of the Lusk Creek Roadless Area is located along the Lusk Creek and Shawneetown fault zones and has a relatively high potential for deposits of fluorspar and associated barite, galena, and sphalerite. Geochemical data indicate that fluorspar mineralization was widespread in the study area, and the potential for deposits of fluorspar away from the fault zone is considered to be moderate. Deposits of limestone, sandstone, and shale could be used as sources for construction materials, but similar deposits outside the area are nearer to transportation facilities and consumer markets. Minable deposits of coal are not present in the study area, and the potential for commercial accumulations of oil and natural gas is low.

INTRODUCTION

The Lusk Creek Roadless Area is about 12 mi south of Harrisburg, Ill. and 2 mi northeast of Eddyville, Ill. (fig. 1). Roughly 89 percent of the surface rights and 58 percent of the mineral rights are under Federal ownership (fig. 2). Applications have been filed for lease of oil and gas rights on about 36 percent and for mineral prospecting on 14 percent of the area (fig. 3). These applications account for about 70 percent of the Federally owned mineral rights.

The Lusk Creek study area lies near the southern edge of the Illinois basin and south of the intersection of two major fault zones (fig. 4); one associated with the Mississippi Embayment (Ervin and McGinnis, 1975), and the other with the 38th Parallel Lineament (Heyl, 1972). It also is along the western edge of the Illinois-Kentucky fluorspar district, the major fluorspar-producing area within the conterminous United States.

Commercial extraction of fluorspar has occurred within the study area at Rock Candy Moutain mine and adjacent to the study area at the Lost 40 and Ora Scott mines (fig. 5). These mines were worked intermittently between 1941 and 1952. Most of the production came from the Rock Candy Mountain mine (Bureau of Mines file data). Minor amounts of galena and sphalerite have been reported as having been recovered from all three mines (Weller and others, 1952).

GEOLOGY

The geologic map (fig. 6) shows two distinctly different structural patterns in the study area (Klasner, 1982). The Lusk Creek and Shawneetown fault zones in the eastern part of the area consist of intensely faulted terrane 1,000 to 2,000 ft wide. Blocks of Mississippian and Pennsylvanian strata are exposed within these zones, and vein deposits of fluorite, calcite, quartz, and associted galena and sphalerite occur in the Mississippian rocks along the fault zones. All past mining activity was confined to this zone (fig. 5). In contrast, gently dipping, relatively undisturbed Mississippian and Pennsylvanian strata underlie the western two-thirds of the area. Mapping (fig. 6) indicates that some faulting occurred here, but was not as intense as that in the eastern part of the area.

Nearly flat-lying Mississippian micritic and bioclastic limestone of the Kinkaid Limestone and siltstone of the Degonia Sandstone are exposed in the southwestern part of the study area. Deeply incised valleys were cut into the Mississippian strata by south-southwest flowing streams prior to deposition of younger rocks, producing an irregular erosion surface on which the overlying Caseyville Formation of Pennsylvanian age was deposited (Potter and Desborough, 1965). The Caseyville consists of about 500 ft of relatively flat-lying, commonly crossbedded and ripple-marked, relatively coarse-grained conglomeratic quartz sandstone. The Abbott Formation, also of Pennsylvanian age, is finer grained than the underlying Caseyville, and tends to have a clayey-micaceous matrix. Both formations show local intense secondary iron-oxide enrichment.

GEOCHEMCIAL STUDIES

Spectrographic and chemical analyses of bedrock, soil, and stream-sediment samples collected by the U.S. Geological Survey were performed to establish background concentrations of 33 elements and to delineate areas of anomalous elemental enrichment in the study area. The results (Klasner and Day, in press) show the average values of fluorine, barium, and lead in the study area are high relative to average crustal values given by Turekian and Wedepohl (1961) for similar rock types. Fluorite is a consituent of the mineral fluorite, and barium, lead, and zinc are elements commonly associated with fluorite in fluorspar deposits in the Illinois-Kentucky fluorspar district. As a consequence, anomalous amounts of these elements in geochemical samples (fig. 7) may indicate the presence of fluorspar deposits.

MINERAL RESOURCE POTENTIAL

Mineral commodities evaluated for their resource potential in the Lusk Creek Roadless Area include fluorite and associated minerals, coal, oil and gas, and construction materials—limestone, sandstone, and shale. The fluorspar deposits also contain galena and sphalerite, which constitute an important economic resource along with the fluorspar in the Illinois-Kentucky mining district (Grogan and Bradbury, 1968), as well as barite. The elements in these minerals are considered to be indicators of fluorspar deposits.

Elevated geochemical values for fluorine, barium, lead and zinc and the presence of favorable structures are used to evaluate fluorspar resource potential. Geochemical values that are thought to be indicators of fluorspar deposits are grouped according to whether they are above average, high, or anomalous relative to the value for each type of sample from the study area. A value higher than the mean but less than one standard deviation above the mean is considered above average. A value of one to two standard deviations above the average is designated as high, and a value of two or more standard deviations above the mean is anomalous. Areas having potential are classified as high potential or moderate potential based on the following criteria:

HIGH POTENTIAL: Anomalous values of two or more indicator elements (fluorine, barium, lead, and zinc); presence of fluorite, barite, galena, or sphalerite; and presence of major faults.

MODERATE POTENTIAL: Above-average, high or anomalous values of two or more indicator elements and the presence of faults; or localized above-average to anomalous values of two or more of the indicator elements in a group of samples, such as soil samples 28-37 (fig. 7).

Fluorspar and Associated Minerals

Geochemical samples showing above-average to anomalous values for fluorine, barium, lead, and zinc are shown in figure 7. As can be seen, these all occur in above-average to anomalous ranges along the Shawneetown and Lusk Creek fault zones, and along the intersecting faults located in the northwest part of the study area (compare figures 6 and 7). High to anomalous values for these elements also occur in the series of soil samples 28-37 from the northeastern part of the study area, and in isolated samples elsewhere.

It is concluded that the Shawneetown and Lusk Creek fault zones, as well as 0.5-mile-wide zones on both sides of these fault zones, have a high resource potential for fluorspar and associated minerals. These zones have a potential for both vein and strata-bound replacement deposits of fluorspar, a distribution that has been suggested by Trace (1974) and Grogan and Bradbury (1967) for deposits elsewhere in the Illinois-Kentucky district. Other areas, as shown on figure 8, have moderate resource potential for fluorspar and associated minerals.

Coal

The Lusk Creek Roadless Area does not have a potential for coal resources, although thin, discontinuous coal beds are known to exist in the area. Coal was noticed in dump material near a caved shaft on the south bank of a small tributary of Little Lusk Creek (SE1/4, SE1/4, sec. 35, T. 11 S., R. 6 E.), and coal was observed in rubble along the west bank of Lusk Creek near sample locality ILC-1 (see fig. 5). No other coal was observed; only thin, discontinuous beds of coal lie beneath the study area.

Construction Materials

Limestone, sandstone, and shale in the study area have limited value as construction materials. Limestone may be of limited use as road metals for local road construction. Although chemcial analyses of sample ILC-11 (Thompson, 1982, p. 18) indicate a high-calcium limestone (98.3 percent $CaCO_3$), the area is a long distance from a consumer market and the acreage amenable to development is limited by the extent of sandstone and shale overburden. Similarly, the amount of limestone available for crushed stone for construction is limited. Shales of Pennsylvanian age are interbedded with sandstones, and tend to be silty, poorly exposed, and less than 3 ft thick. Firing tests of two of these shales (ILC-1 and ILC-2, fig. 5) show a potential for the manufacturing of brick and one sample, ILC-1, also shows potential for lightweight aggregate (Thompson, 1982, p. 18). Limited thickness and excessive overburden preclude commerical development of these shales.

Partially conglomeratic, crossbedded sandstones and interbedded shales of the Caseyville and Abbott Formations are the most extensively exposed rocks in the study area. The sandstones show a high degree of iron-oxide staining, which is most prominent in crossbedded units. The mineral resource potential of these sandstones is low because of the abundant impurities and because similar deposits outside the study area are nearer to transportation facilities and markets.

Oil and Gas

A structure contour map on the Mississippian Beech Creek Limestone (fig. 9) shows that the Lusk Creek Roadless Area lies on the southeast flank of a structural basin. Geologic mapping (fig. 6) shows monoclinal north-northwest dippings beds consistent with the northwest-dipping Beech Creek strata at the basin margin, and it may be concluded that anticlinal or domal structures that might be oil and gas traps are absent. A potential structural trap exists however, where the northwest-dipping strata are truncated along the Lusk Creek-Shawneetown fault zone.

Although strata with known oil-producing potential elsewhere in Illinois exist beneath the study area, available data suggests that the potential for strucutral or stratigraphic entrapment of oil is poor. Because hydrocarbons are known to have leaked along the faults, and because oil was not discovered in wells drilled on an anticline that has a structurally higher position than the Lusk Creek area (see anticline on the northwest side of Burden Falls Roadless Area, fig. 9), it is highly unlikely that commerical deposits of oil exist beneath the Lusk Creek Roadless Area.

MINERAL RESOURCE POTENTIAL MAP OF THE LUSK CREEK ROADLESS AREA, POPE COUNTY, ILLINOIS

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1983

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